BULLETIN No. 20. (Dairy No. 19.)

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF ANIMAL INDUSTRY.

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THE MILK SUPPLY OF BOSTON

AND OTHER NEW ENGLAND CITIES.

BY

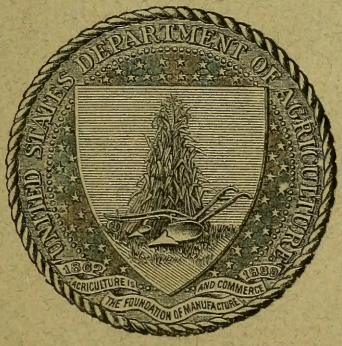
GEORGE M. WHITAKER, M. A.,

SPECIAL EXPERT AGENT, DAIRY DIVISION.

Under the direction of

Dr. D. E. SALMON,

Chief of the Bureau of Animal Industry.



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GOVERNMENT PRINTING OFFICE.

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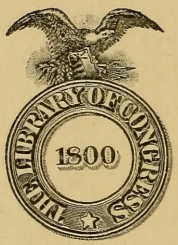

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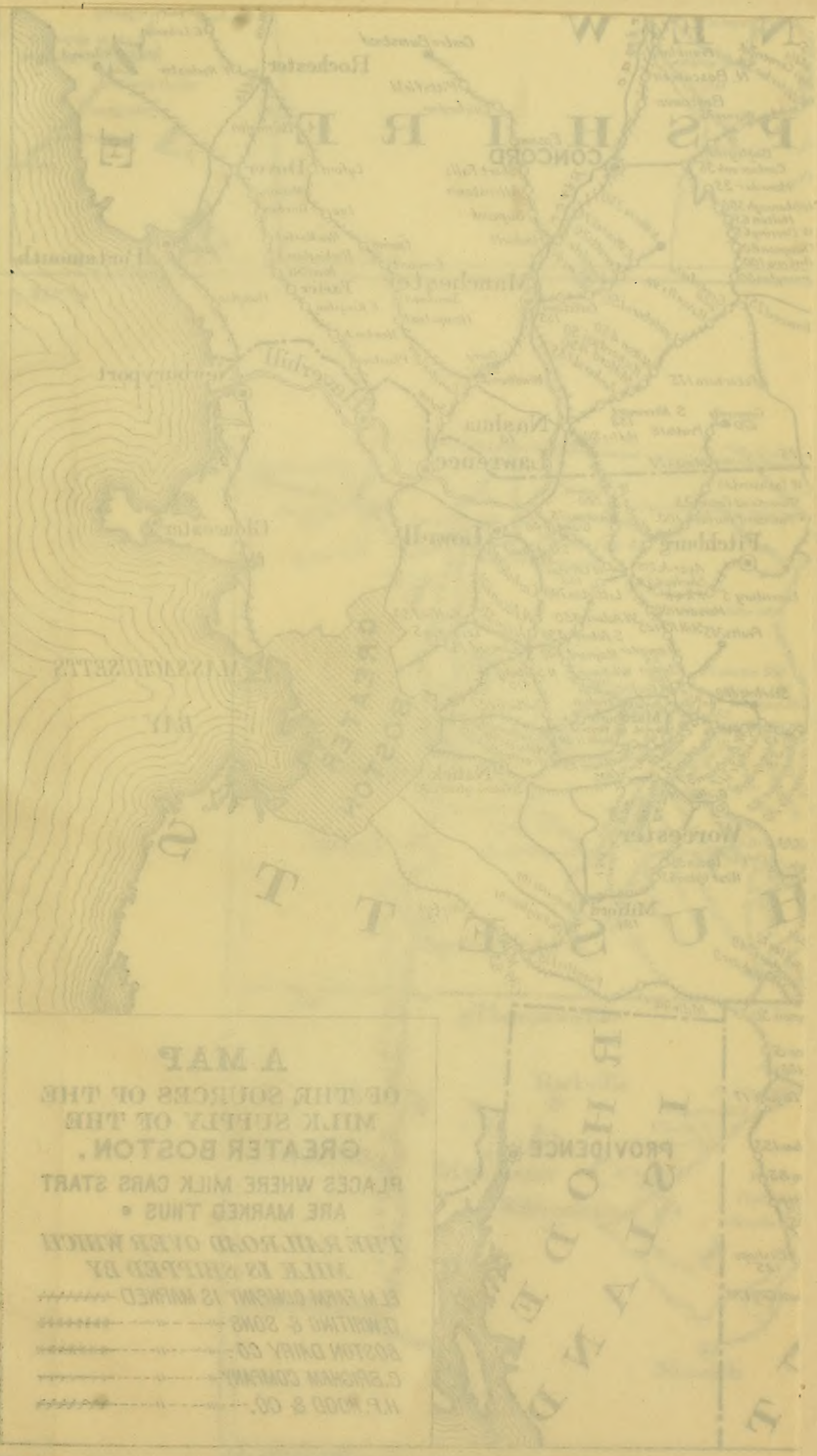
PROVIDENCE

A MAP
OF THE SOURCES OF THE MILK SUPPLY OF THE GREATER BOSTON.
PLACES WHERE MILK CARS START ARE MARKED THUS •
THE RAILROAD OVER WHICH MILK IS SHIPPED BY
ELM FARM COMPANY IS MARKED
D. WHITING & SONS
BOSTON DAIRY CO.
C. BRIGHAM COMPANY
H.P. HOOD & CO.
VERMONT
NEW HAMPSHIRE
MAINE
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
MASSACHUSETTS BAY
GREATER BOSTON
CONCORD
Manchester
Nashua
Lawrence
Lowell
Fitchburg
Worcester
Springfield
Holyoke
Northampton
Pittsfield
Rochester
Dover
Portsmouth
Haverhill
Newburyport
Gloucester
Natick
Milford
Marlboro
Keene
Bellows Falls
Brattleboro
Hartford
Manchester
Willimantic
Middletown
Norwich
Providence
Thompsonville
Rockville
Connecticut River

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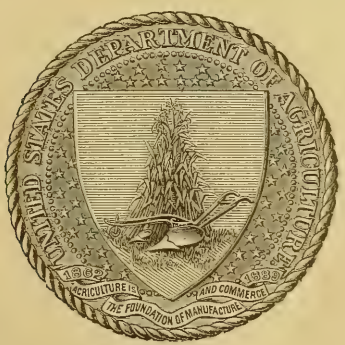

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GOVERNMENT PRINTING OFFICE.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Animal Industry,
Washington, D. C., January 18, 1898.

Sir: I have the honor to transmit herewith, for publication as a bulletin of this Bureau, a report on the milk supply of Boston and other cities in the New England States, prepared under the immediate supervision of Maj. Henry E. Alvord, Chief of Dairy Division, by George M. Whitaker, M. A., special agent of that division.

Mr. Whitaker is the acting executive officer of the Massachusetts State Dairy Bureau, and has been for some years secretary of the New England Milk Producers' Union. He has made the subject of city milk supply a special study, and this report contains much information of general interest.

Very respectfully,

D. E. Salmon,
Chief of Bureau of Animal Industry.

Hon. James Wilson,
Secretary of Agriculture.

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THE MILK SUPPLY OF BOSTON AND OTHER NEW ENGLAND CITIES.

POPULATION.

The New England States, by the census of 1890, have a population of nearly 5,000,000 people, divided as follows:

Massachusetts	2,238,943
Connecticut	746,258
Maine	661,086
New Hampshire	376,530
Rhode Island	345,506
Vermont	332,422
Total	4,700,745

Massachusetts, by the State census of 1895, has a population of 2,500,183. Fifty per cent of these people live in the cities or large towns—those of 10,000 population or above. Forty-one per cent of the population of New England live in cities of over 20,000 inhabitants. Boston is the largest city and the commercial center of New England, with a population of 496,920 (census of 1895). This one city therefore contains 10 per cent of all the population of New England; more than any one of the States of Rhode Island, New Hampshire, or Vermont. But Boston is surrounded by a group of towns and cities, twenty-three in all, which, according to the State census of 1895, have a total population of 451,000, as follows:

Cambridge	81,000	Medford	14,000
Lynn	62,000	Hyde Park	11,000
Somerville	52,000	Melrose	12,000
Chelsea	31,000	Stoneham	6,000
Newton	27,000	Arlington	6,000
Malden	29,000	Belmont	3,000
Waltham	20,000	Saugus	4,000
Quincy	20,000	Winchester	6,000
Woburn	14,000	Watertown	7,000
Brookline	16,000	Revere	7,000
Everett	18,000	Milton	5,000

The interests of these towns are closely allied with those of Boston, and their business men to a large extent do business in Boston. The business interests of this section are identical, though it includes twenty-four separate municipalities. Consequently it is frequently

alluded to as the "Greater Boston." The Greater Boston has a population which exceeds 948,000. This is 18 per cent of the population of New England—more than any New England State except Massachusetts, and more than any two of the three smaller States.

Providence is the second New England city, with a population exceeding 150,000.

Aside from the Greater Boston and Providence, no New England city, by the census of 1890, had a population exceeding 100,000. The following five cities, with a total of 374,000 persons, each had a population exceeding 50,000, but less than 100,000:

	Census of 1890.	State census of 1895.
New Haven, Conn	86,000	.....
Worcester, Mass	84,000	98,000
Lowell, Mass	77,000	84,000
Fall River, Mass	74,000	89,000
Hartford, Conn	53,000	.....

The following nineteen cities (total, 534,000) had a population between 20,000 and 50,000, and thirty-six others had a population of from 10,000 to 20,000 each:

	Census of 1890.	State census of 1895.		Census of 1890.	State census of 1895.
Bridgeport, Conn	49,000	.....	Brockton, Mass	27,000	38,000
Manchester, N. H	44,000	.....	Haverhill, Mass	27,000	30,000
Lawrence, Mass	44,000	52,000	Taunton, Mass	25,000	27,000
Springfield, Mass	44,000	51,000	Lewiston, Me	22,000	.....
New Bedford, Mass	41,000	55,000	Fitchburg, Mass	22,000	26,000
Portland, Me	36,000	.....	Woonsocket, R. I	21,000	.....
Holyoke, Mass	35,000	40,000	Gloucester, Mass	21,000	28,000
Salem, Mass	30,000	34,000	Meriden, Conn	21,000	.....
Waterbury, Conn	28,000	.....	Lincoln, R. I	20,000	.....
Pawtucket, R. I	27,000	.....			

A study of the milk supply of these cities, therefore, is a study of the milk supply of half of the population of New England. Furthermore, a consideration of the milk supply of New England must, to a considerable extent, be devoted to the milk supply of the Greater Boston, which has 18 per cent of all the population of New England and over one-third of the city population of that section, the remainder being distributed among sixty-four places.

It is proper that Boston should receive almost a monopoly of attention for another reason than that of its relative size and commercial importance. It is about the only city in New England whose supply presents interesting and peculiar conditions.

Nearly all of the milk supply of the other cities and large towns comes from sources within a dozen miles of the point of consumption, and is largely distributed by producers from their own wagons. The ordinary milk peddler is such a familiar spectacle, so similar to every other peddler, as to make a detailed report of his work in the different

cities an uninteresting repetition of substantially the same methods, conditions, and circumstances which are already well known. On the other hand, most of the Greater Boston supply coming from more remote distances by railroads, presents conditions peculiar to itself.

MILK SUPPLY—TRANSPORTATION, DISTRIBUTION, STATISTICS.

BOSTON.

Cars.—Three-fourths of the milk supply of the Greater Boston reaches the city by railroad. The longest direct run is 140 miles, and some railroad milk comes only 20 miles. Most of this milk is conveyed in cars built for this especial purpose, with refrigerator closets for the cans of milk and with provision for steam heat. Thus refrigeration in summer and warming in winter are provided. Some of the cars have an office room provided with chairs, desk, and pigeonholes for the use of the man in charge of the car. Here he has all needed conveniences for keeping record of the milk taken at the different stations, and other necessary accounts.

These cars are leased from the railroads by wholesalers. These wholesalers furnish the carmen, ice, and other supplies; the railroad hauls the cars on passenger trains or in special milk trains, according to convenience in individual cases. Most of the cars start in the morning, from 4 to 6 o'clock, and reach the city between 10 and 11. In a few instances the car starts the afternoon previous, and is on the road over night, reaching Boston during the next forenoon. The cars, in the summer, frequently take the milk of the same morning; some start too early for the milk of that morning, especially in the winter, and hence bring the milk of the previous day. Milk is therefore eighteen to thirty hours old before reaching the city. The number of these milk cars averages about 35, although varying somewhat with the season.

Cans.—The milk sold in Boston is shipped in 8½-quart cans, with a handle on one side and turned wooden stopples. The quart is, by statute, the wine measure quart.[1] No one in the trade to-day can tell why this size and shape of cans was originally adopted. The advantages claimed for them are: Convenience in handling, convenience in retailing (as many customers buy one or two cans), convenience to many small farmers who can fill only two or three cans per day, convenience in transportation (as the cans can be stacked several tiers high), cleanliness in retailing where milk is poured from the can, as it is sooner emptied than a 40-quart can, and hence the milk is exposed to the air and dirt a much less time.[2]

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[1] One quart, wine measure, is 57¾ cubic inches, or 2 pounds 1⅓ ounces of water, and 2 pounds 2⅔ ounces of milk.

[2] On the other hand, there are serious objections to the Boston can. Five small cans cost more than one large one and are more difficult and expensive to clean. The danger of loss and damage is increased. But the worst thing about it is the wooden stopple. Milk enters the pores of the wood and penetrates so far that no

For several years in the early history of the business there was in use a can containing 8½ quarts beer measure,[1] equal to about 10 quarts wine measure; but it gradually dropped out of use, the smaller can being more popular. The larger can is yet in use in Providence, R. I., but the 8½-quart can, wine measure, is generally used throughout New England. The business was formerly done by beer measure, and these 8½-quart cans, wine measure, hold 7 quarts, beer measure. The agitation for the change was partly based on the expectation that there would be more money for farmers and middlemen by getting 8½ quarts into a can that had formerly contained 7 quarts. But consumers were not slow to discover that they were getting a smaller quart, and the attempt failed to gain the price of 1½ quarts per can by the fiat that the quart should be smaller.

A carload of milk is generally considered to be 900 cans, but the peculiar shape, with flat-top wooden stopples, allows of stacking them in tiers, so that in an emergency several hundred more cans can be put into a car. By filling passageways and other open spaces as many as 1,200 cans (10,200 quarts), or over 10 tons in weight, can be got into a car. Railroad officials consider 10 tons a carload. The nominal load, however, is 900 cans (7,650 quarts).

The accompanying illustrations (Plates II, III) show the general shape of the cans and illustrate the method of handling them. These engravings present a familiar daily sight at the milk depots when the milk trains arrive.

Historical.—Boston seems to have been the pioneer city of the United States in the transportation of milk by railroad. The year 1830 may be taken as the commencement in the United States of the railroad system—the use of steam applied to locomotives. Soon after this we find the Boston peddlers reaching out into the country for a milk supply. Jason Chamberlain was the first man to bring milk to Boston by railroad, and the time of his beginning was April, 1838. He operated on the Boston and Worcester Railroad. He sold milk at 25 cents per can of 9½ quarts. Mr. Chamberlain sold his business to Rufus Whiting, who is said to have been the first to start an express business on the Boston and Worcester Railroad. He was an associate with, and sold his business to, Mr. Harnden, the now famous express promoter. This milk came by express, but in a baggage car. The first milk car was run soon after, by a company of peddlers, between Westboro and Boston. This was followed by the Boston Milk Company,

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cleaning process is efficient. Stopples split have shown penetration for half an inch, commonly, and sometimes more, and from these pieces germ cultures have been made of an extremely objectionable and offensive kind, although the stopples had been soaked, scalded, and steamed, and were supposed to be clean and harmless.

H. E. A.

[1] One quart, beer measure, is 70½ cubic inches, or 2 pounds 8⅝ ounces of water, and 2 pounds 10 ounces of milk.

FIG. 1.—MILK TRAIN AT CITY TERMINAL, BOSTON.

FIG. 2.—INTERIOR OF MILK-RECEIVING SHEDS, CITY TERMINAL.

FIG 1. MILK DEPOT OF BOSTON CONTRACTOR.

FIG. 2.—INTERIOR OF MILK-CONTRACTOR'S DEPOT, BOSTON.

which ran a car to Cordaville, and by Rowell & Kelly, who took milk from Northboro and Fayville. In April, 1843, the New England Farmer said:

We have learned that one man brings in upon the Worcester Railroad about 200,000 gallons annually. This is supposed to be about one-tenth of all that is sold in the city. Two millions of gallons per year is the estimated amount of consumption in Boston. This, at 20 cents per gallon, costs the citizens $400,000 per year, and, supposing the population to be 100,000, this gives to each inhabitant yearly 20 gallons, or a small fraction less than half a pint per day. The dwellers in the city of "notions" have a notion that they pay the farmers a good price for milk. Five or 6 cents per quart is usually given. This pays the farmers of the immediate vicinity as well as they get paid for most of their productions. But can those farmers live who sell milk at their doors at 10 cents per gallon in the summer and 12 cents in the winter, or at an average of 11 cents? Many such farmers there are, and some sell at lower rates than this, and yet the milk dealer gets no more than a fair compensation for his labors, expenses, and risks.

An article from the Albany Cultivator, reprinted in the New England Farmer September 6, 1843, said:

A brighter day is dawning on the dwellers in cities so far as milk is concerned, and the venders of swill slop, cold water, and artificial milks are finding their business seriously endangered. This is being brought about by the influence of railroads, which, spreading a network over the country and centering in the cities, bring the farmers and dairymen residing within 50 miles of the city within a few hours, and enable them to offer their products in the best possible condition for competition. This effect was first extensively felt in Boston in the reduction of the price and the bettering of the quality of milk, though that city had never been forced to use such scandalous stuff as was sold in other places for milk. At the present time a large portion of the milk used in that city is received by the railroads from country dairymen. The same beneficial effects are beginning to be felt in New York.

At one time two cars were loaded daily at Westboro, some farmers driving 15 miles daily to the railroad station with their supplies. Although milk consumption has increased and the milk territory has extended wonderfully since then, the shipments from this station have decreased. The growth of neighboring towns has caused more milk to be used near where it is produced.

The railroad business above noticed developed on the Boston and Worcester Railroad, entering the city on the south side. Meanwhile, however, similar enterprises had been undertaken on the north side of the city. Peddlers had gone out to Concord, Mass., and other places for milk and supplies.

T. W. Wellington, of Newton, was the first to buy milk in Wilton, N. H., for the Boston market. For about a year Mr. Wellington continued in the business, taking less than 200 gallons per day in a baggage car. Mr. Wellington sold to David L. Pierce, a retail milk dealer in Boston, who increased the business so that a special milk car was necessary. After continuing in the business for three or four years he sold to David Whiting, in the spring of 1857.

Present wholesale methods.—These early shipments of milk were made

by peddlers who brought into the city the milk which they needed for their retail trade. But as the business increased there happened what has taken place in every other industry—specialization. Handling milk at wholesale became a distinct business from retailing, and the men who brought in railroad milk came in time to devote the whole of their energy and capital to buying milk of the farmers, transporting it, and selling to retailers.

Various changes have taken place in the personnel of these firms of pioneer peddlers and subsequent wholesalers, but many of the names early identified with the business are still in use. Consolidations have also taken place, till to-day the business of transporting milk to the city by railroad is done by seven concerns. Six of these seven milk wholesaling houses have an association for bringing about uniformity in methods of doing business and for mutual self-protection. To-day fully three-quarters of the milk supply of the Greater Boston passes through the hands of these large wholesalers, locally known as "contractors."

These contractors furnish the cans for the business and lease the cars of the railroads. They furnish men and supplies for the cars. In some cases they have loading platforms at shipping stations. At a number of convenient points in the country they have ice houses and cut their own supply of ice. In the city they have platforms, storehouses, refrigerators, offices, etc., near the railroad tracks; and their cars on reaching the city are switched onto the side tracks at their business depots. The loading and unloading is done by the contractors.

All of the contractors have cheese or butter factories in the city or country, or both, for the manufacture of butter and cheese.

The milk is bought in the country at a price for the milk delivered at the car at the different country railroad stations. In some instances each farmer carries his milk to the railroad station; in others the farmers in one neighborhood or in one locality cooperate in an arrangement with one of their number to do the teaming; in yet other instances the contractors employ someone to haul milk from the farmers' doors to the railroad station, and deduct the expense from the amount due the farmers for milk. Milk is frequently drawn 6 miles to a railroad station, and in some cases as far as 10 to 15 miles.

The wholesalers or contractors.—The various companies and individuals above alluded to as carrying milk on the Boston and Worcester Railroad, on the south side of the city, consolidated into the firm of C. Brigham & Co. to do a strictly wholesale business. This company later became incorporated as The C. Brigham Company, and is yet in the business.

Mr. David Whiting, who bought the business of Mr. Wellington, as noticed above, was a large and successful farmer. Although driven into the business to protect his interests, the traits of character which brought success in other enterprises made him successful as a milk wholesaler. In 1865 he associated with him his sons, George O. and

Harvey A., under the firm name of D. Whiting & Sons. The business is continued to-day under the same name, two of Mr. Whiting's grandsons being among the executive officers.

Mr. H. P. Hood began in the milk business in Boston, as a peddler, in 1846. For nine years he bought milk of contractors, but in 1855 he began running a car on his own account from Derry, N. H., to which place he moved. He has been in the wholesale milk business ever since, and has increased the business from one to eight cars. His sons are now associated with him in the management of the business.

The Boston Dairy Company is the newest of the larger companies; it is the consolidation of several interests, and is a continuation of the long-established business of Tower & Whitcomb. Mr. W. A. Graustein is the executive head.

The Elm Farm Company was started by a wealthy farmer-manufacturer, Mr. Ray, of Franklin, Mass., as a means of marketing his own milk independent of the regular contractors; but he soon commenced buying milk of his farmer neighbors, and the business extended until the company confined itself to a wholesale business.

Mr. J. F. French brings one carload per day into the city, and has done so for several years.

These are the component elements of the contractors' association.

In addition, one car of milk per day is brought into the city by the Deerfoot Farm Company of Southboro, Mass., much of which is sold direct by themselves to the consumers. The Deerfoot Farm Company was started by Hon. Edward Burnett to furnish high-grade Jersey milk to patrons able and willing to pay a corresponding price, but latterly the business has increased so as to include, in addition to the above, a general wholesale trade. Mr. Robert Burnett is the executive manager.

Mr. George O. Whiting, the executive head of D. Whiting & Sons, owns a controlling interest in the C. Brigham Company and in the Elm Farm Company. He is a man of much executive energy, and is known as "the milk king of New England."

Statistics.—The members of the Milk Contractors' Association report monthly to each other their receipts and sales, and have done so for years, so that much valuable information has accumulated in connection with the business. These figures are not absolutely infallible for purposes of comparison, because the association has occasionally taken in new members, whose receipts and sales are then added to those of the others. But those persons to whom such statistics are serviceable can make some allowance for this and find much value in the figures.

We give below some recent tables on this subject, the figures representing the number of 8½-quart cans:

Year.	Receipts.	Sales.	Surplus.
1892	9,212,667	7,315,135	.....
1893	9,263,487	7,619,722	1,643,765
1894	9,705,447	7,657,421	2,048,026
1895	9,856,500	8,040,732	1,815,768
1896.			
January	844,709	651,827	192,882
February	808,383	611,793	196,590
March	871,572	657,039	214,534
April	891,275	672,561	218,714
May	1,005,115	696,599	308,516
June	994,817	675,796	319,021
July	899,397	712,188	187,209
August	854,913	687,224	167,689
September	866,691	635,092	231,599
October	960,734	699,245	261,489
November	885,903	690,920	194,983
December	898,599	707,095	191,504
Total	10,782,108	8,097,379	2,684,730
1897.			
January	923,852	705,324	218,528
February	835,115	639,952	195,163
March	960,084	719,814	240,270
April	976,996	733,298	243,698
May	1,105,325	759,875	345,450
June	1,115,234	752,038	363,196
July	1,013,552	789,849	223,703
August	966,058	720,374	245,684
September	956,445	732,795	223,650
October	1,037,764	751,944	285,820
November	962,552	708,459	254,093
December	945,254	724,850	220,364
Total	11,798,231	8,738,572	3,059,619

Milk Producers' Union.—Before going on to speak further about the prices of milk and some of the detailed methods of handling it which are peculiar to Boston, a word should be spoken about the Milk Producers' Union. This is an organization of the farmers who sell milk to the contractors. The farmers of the several shipping towns form a local organization and send delegates to an annual meeting of the central union, which elects executive officers and transacts other necessary business. The organization has been in existence in one form or another since 1886. The work of the union, which has been supplemented by that of the association of wholesalers, who regulate the business from their end, has been to promote uniformity and business-like methods. The tabulation and publication of the above statistics were brought about through the combined efforts of the Milk Producers' Union and the Milk Contractors' Association. The prices of milk are usually arranged by mutual agreement between the contractors and the officers of the Milk Producers' Union. Blanks are sent semi-annually to the producers belonging to the union, on which they express their opinion as to the price of milk and state the number of cans shipped. These replies are averaged on the basis of cans rather

than individuals; and the negotiations between the contractors and the union are based upon this expression of opinion.

The union has the machinery in its constitution for ordering a strike, so to speak, in case of an emergency. Two or three times in the history of the union a rupture of this kind has seemed imminent, but it has been averted for the best interests of all, usually by mutual concessions, so that the farmers have gained directly by having an organization. They also feel that they have gained some unfought battles, and believe that they have generally been treated better by the contractors, by reason of having an association, than they would have been if the contractors were dealing with individuals, or simply issued an ultimatum of what they would pay for milk without their authority being questioned. At times some farmers have been dissatisfied with the work of the union because it was not more radical and sweeping, but in the main the more conservative farmers feel that it has been of great service to them. The existence of such an organization has tended to promote uniformity in prices, and there has been little variation in prices for a number of years.

Prices paid.—As milk is shipped from stations of varying distances from the city, the following arrangement has been made as a convenient method for determining a price for each station. It has been agreed between the contractors and the Milk Producers' Union that all negotiations should be for a theoretical Boston price per can, and that there should be the following discounts from that price:

	Cents.
For stations between 17 and 23 miles from Boston	8
For stations between 23 and 36 miles from Boston	9
For stations between 36 and 56 miles from Boston	10
For stations between 56 and 76 miles from Boston	11

And 1 cent more for each additional 20 miles.

The price is adjusted twice a year for the six months beginning April 1 and October 1. The theoretical Boston price per can of 8½ quarts for a number of years has been as follows:

Year.	Summer.	Winter.	Year.	Summer.	Winter.
	Cents.	*Cents.*		*Cents.*	*Cents.*
1886	30	36	1893	33	37
1887	30	36	1894	33	37
1888	32	38	1895	33	37
1889	32	38	1896	33	35
1890	32	36	1897	33	35
1891	33	37			
1892	33	37	Average (12 years)	32¼	36⅔

In 1874–75 the winter price per can was 40 cents, the summer price 32 cents; difference, 8 cents. For several of the years included in the above table there was a difference of 6 cents between the summer and the winter prices. In 1890 and 1891 the summer price advanced and the winter price declined, and for four years thereafter there was a difference of 4 cents per can between summer and winter milk. In Octo-

ber, 1896, the winter price was cut again, leaving the difference only 2 cents. The increasing attention given to winter dairying has brought the supply of winter milk nearer to that of summer milk, and made advisable, so the contractors claim, less disparity in price.

The increase of winter dairying has been caused not only by the increased profit in winter milk, but to a certain extent, in market gardening sections, by the desire of farmers who produce milk to carry more cows in the winter in order to get manure for their garden crops.

Payments to the farmers for milk sold to the contractors are made monthly, as soon after the 1st of the month as the clerical work of closing the accounts and drawing checks can be done.

According to the agreement alluded to, the payment per can of milk which the farmer would receive at his railroad station would be the theoretical Boston price less 8, 9, 10, or 11 cents, depending upon his distance from the city. The amount of milk handled by the contractors is so large that these prices govern to a considerable extent the dealings of many milkmen in other places.

When this arrangement was first considered, it was expected that the theoretical Boston price would be the figure at which milk would be sold to the peddlers, and that the discount would therefore represent cost of transportation, cost of doing the business, losses from bad bills, and profits; but competition of one kind and another has reduced the price to the peddlers so that they now pay 3 and 4 cents less than the nominal Boston price, and it has become wholly a theoretical figure, used and useful only as a number from which to subtract the various discounts depending upon distance of transportation. The expenses of doing the business and the profits to the contractors are therefore from 4 to 7 cents per can.

Milk was sold by the contractors to peddlers during the summer of 1897 at 30 cents per can, with rumors of cutting prices to 29 and even 28 cents. Milk is sold by the peddlers at varying prices. Hotels and large restaurants buy close and allow only 2 or 3 cents for handling; they bought during 1897 at 32 to 35 cents per can. Small stores, which retail by the quart the contents of only a few cans, pay 38 to 40 cents per can. Consumers of a can daily pay 45 and 50 cents, and those who have a quart of milk delivered at their houses daily by the milkman pay 7 cents per quart. Sometimes pint customers pay at the rate of 8 cents per quart. By going to the store for it, consumers frequently buy as low as 6 cents, and in some instances for 5. Milk in a few cases seems to be selected by grocers and provision dealers as an article to sell at cost or a little less as a bid for other business.

Grading the price.—One of the peculiarities of the way in which the Boston milk business is carried on by the contractors is what is called "grading the price." To illustrate: The contractors agree to pay at stations situated a certain distance from Boston 24 cents per can for the summer—that is, from April to October. But they do not pay 24

cents for each and every month; instead of that, they pay a price which will average 24 cents. During the flush months of May and June the price may be perhaps 22 cents, and to offset that cut the price will be increased to 26 cents during the sultry months of August and September, when milk is sometimes scarce. This "grading" has a tendency to discourage exceptionally large shipments during months when the supply would naturally be the largest. It also stimulates production during the months when the supply might otherwise be short. When the price has been agreed upon, the contractors send to each station a card similar to the following:

(For railroad stations in the towns of Chelmsford and Sudbury, summer of 1897.)

The graded price of milk per can of eight and one-half quarts, delivered in good order, with dairy number plainly marked on stopper with stickers, and up to the standard required by law, in the car, for the following six months, from April 1, 1897, will be:

	Cents.		Cents.
April	24	July	24
May	22	August	26
June	22	September	26

Average, 24 cents.

In case the amount of milk received by the contractors and not sold for use as milk shall exceed 5 per cent of the entire sales of the month, then for said excess over and above the 5 per cent the contractors shall pay only what said excess is worth for butter, taking the average price of butter for the month; and the value of the surplus milk, manufactured into butter, shall be determined by a committee of farmers and contractors.

MILK CANS.

Milk cans are the property of the persons or company whose name is stamped upon them. The ownership is absolute. The legislature has passed a law which makes it a criminal offense, punishable by fine and imprisonment, to retain or make use of a milk can for any purpose whatever without the consent of the contractor or owner. (See chapter 440, Acts of 1893.)

Contractors' surplus milk.—As stated above, the contractors and the Producers' Union agree upon a price for six months in advance. In doing this the purchasing contractors seem to be taking some chances, for they can not foresee the demand. Particularly is this the case in the summer, for then the demand depends much on the weather, as a hot, sultry "spell" causes the consumption of milk to increase rapidly. Further than this, the contractors appear to take large chances in another way. They agree to take all the milk that the farmers supplying them with milk at the various shipping stations may produce. This leads to receipts largely in excess of the demand, as has been seen by the preceding tables of receipts and sales; the excess sometimes reaches one-fourth of the receipts. The contractors save themselves from loss by an arrangement by which the stipulated price is paid for only such milk as is sold again and for a small margin in excess (equal to 5 per cent of the sales; see above card). All surplus beyond this is made into butter by the contractors, at their creameries, on the farmers'

account, allowing each month, as the value of the butter, the average of the jobbing price of butter quoted by the chamber of commerce during the month and charging 4 cents per pound for making. Thus the farmer is sure of getting at least butter value for all the milk he can make. To protect the farmers from an undue extension of this surplus privilege, the contractors agree not to extend their routes or enlarge their territory. The advantages of this surplus system are:

(1) The market is more steady than it would otherwise be. The figures above show that the price has been very uniform for many years. The surplus, being in the hands of the large dealers, does not get upon the market, and the supply offered to the retail trade by the contractors is never in excess of the demand.

(2) The contractors have a large reservoir to draw from when sultry summer weather or other cause increases the demand; hence the market is never short of milk.

(3) The farmers find a market for more milk than they otherwise would, though the surplus portion is sold at much less than the other part. The butter value of the surplus milk for the year 1896, less the cost of making, was 13 cents per can, a fraction over 71 cents per hundred pounds. For 1897 the butter value of a can of milk averaged 13⅓ cents, a little better than for 1896.

The disadvantage of the system is that it is the cause of much friction between the producers and the contractors. The surplus offers a good opportunity to increase the farmers' natural suspicion of the contractors. The application of the system is blind to many farmers, some of whom even question the honesty of the contractors in accounting for the amount of the surplus. This difference is further intensified by the method of settling with the farmers. The contractors, for their convenience, ascertain how much of a discount the butter value of the surplus would create on the whole amount of milk which a farmer ships, and in making their payment they deduct this amount from what would be due if all milk shipped had been sold at the long price. Hence the monthly bills are not written for the proportionate amount of sale milk at, for instance, 20 cents, plus the proportionate amount of surplus milk at, for instance, 13 cents; but, it having been found that the amount of surplus milk and its butter value is enough to reduce the average price of milk at a 20-cent station 1½ cents, when the farmer makes out his bill for his full shipment at 20 cents per can the contractors discount the bill 1½ cents per can and remit the balance.

The surplus for May, 1897—the butter value of milk being 11 cents per can—amounted to an average discount per can on all shipments as follows:

	Cents.
Where price was 19 cents	2.26
Where price was 20 cents	2.54
Where price was 21 cents	2.82
Where price was 22 cents	3.11
Where price was 23 cents	3.39

In this way the contractors' clerks can figure the accounts quite rapidly; but the method increases the dissatisfaction with the system, because to the mind of the farmer the butter value of surplus milk creates an actual discount or a "charge back" on the whole of his bill.

This system of buying all the milk that is offered furnishes shippers a market for all they can produce, but this in turn tends to increase the surplus, which reached unusual proportions during the years 1896 and 1897. This, coupled with the low price of butter, made the discount for those years more than twice what it had previously been. The records of milk meetings and farmers' gatherings show that the surplus is the great cause of dissatisfaction, the burden of many resolutions and speeches being that the contractors should buy "straight." The contractors have sometimes agreed to take all chances of surplus and pay a straight price if they could buy for 2 cents less. Before this system was introduced there was much complaint at the irregularity of the amount sold to the contractors. If the supply ran ahead of the demand, the farmers would receive notice to keep back part of their supplies; and they were liable to be obliged to make butter or cheese in varying quantities every few days. This was a great inconvenience and caused much grumbling, which was remedied by the contractors adopting the present plan, taking all produced and paying butter price for the surplus. But that was so many years ago that the improvement is not generally remembered. The feeling against the surplus was so strong in 1889 that the matter was referred to the State board of arbitration, which decided that the principle was a sound one.

It should be stated here that the different wholesale firms report their receipts, sales, and surplus to their organization and to the Milk-Producers' Union, and the discount is figured on the totals, being the same to all farmers at equal distances from the city, regardless of the contractors to whom they sell or the amount of surplus which their individual wholesaler may have had.

Retailing.—On the arrival of the milk cars in Boston they are run onto the railroad sidings of the milk contractors from 9 to 11 o'clock a. m., regardless of the distance the cars have come. The peddlers by this time have finished their morning's distribution of milk and their wagons are backed to the contractors' platforms and sheds for the next day's supply. The cans are quickly transferred from the cars to the peddlers' wagons. In a few cases, where there are customers for several cans, a delivery is made at once, but most of this milk is carried to the different peddlers' headquarters. Here the milk is run through a large mixer, so as to insure uniform quality. Then it is drawn off into quart and pint cans, of tin, and placed on ice. The next morning about 2 o'clock the peddler starts out to deliver this milk to the customer, leaving at the door of tenement, flat, and dwelling house the can of milk, usually before the family is out of bed. By this it will be seen that the milk is in the city about eighteen hours before reaching the consumer.

It will also be noticed that the milk is delivered in individual cans, never poured or dipped from the large can to the consumer's dish. According to the milk inspector of the municipality of Boston, the number of persons selling milk from wagons during 1896 was 598, and the number of shopkeepers who sold milk was 1,019. In Cambridge there were 189 peddlers and 111 store milk dealers. The numbers remained practically the same in 1897. Nearly all of the peddlers use wagons of the same style—the body like an express wagon, with a rounded canopy top, open at the front and rear.

Clean cans.—When the retailers go to the wholesalers' depots for their daily supplies they usually take with them return cans, belonging to the wholesalers, in which they have taken their supplies on a previous day. These cans are immediately rushed on board the cars, so that the latter may be ready with as little delay as possible to be drawn out and made up in the trains for returning. On account of this procedure the cans are returned to the farmers unwashed, and sometimes in a very filthy condition, for a can may have been delivered by the peddler to a grocer where a portion of the contents which was unsold has soured and stuck to the bottom and sides of the can before the peddler calls for it to return to the wholesaler; in exceptional cases the can may have been used for other articles, possibly kerosene oil. The farmers have frequently consulted together as to the best means of bringing some pressure to bear on the contractors to compel them to return clean cans. This feeling has gone so far as to result in several attempts to induce the legislature to pass compulsory laws on the subject.

The contractors make two excuses for this way of doing business. The first is the matter of expense; they claim that to have the cans washed before returning would mean the impossibility of getting them onto the car that day, and the necessity of having a large investment of money tied up in a triplicate set of cans. The second excuse is that even if they washed the cans, after having been tightly bunged up in the car and on the road for several hours, they would be unfit for use in reshipping milk without being scalded. The contractors claim that if the cans are sent into the country clean many farmers will neglect this precaution, and that the next day's milk would reach the city in worse condition than when the cans are carefully cleaned, scalded, and aired at the dairy before putting fresh milk into them.

Methods of producers and shippers.—The methods pursued by the milk-producing farmers who supply the contractors may be described more in detail, as follows:

For example, a neighborhood may be taken in Windsor or Windham County, Vt., from which the milk is hauled by wagon to Bellows Falls and there put on the milk car.

The process by which the milk is prepared for marketing is simple, though it requires care and attention to preserve an equal temperature.

The morning's milk is cooled by various methods, some employing ice, while not a few suspend the cans in a well. When the night's milk has been cooled, a wood stopper is placed in the full can, upon which is pasted a small adhesive stamp a trifle smaller than a postage stamp, and on this is printed the number of the dairy, as well as the number of the car conveying the milk from Bellows Falls to Boston.

As a rule neighboring dairymen have an arrangement by which one of their number takes the daily product to the main highway, where the cans are picked up every night by the milk wagon and the "empties" returned by the same conveyance in the morning. In some cases, however, the farmer lives 3 or 4 miles off the route, and of course is obliged to bring his own milk.

One route starts from Chester, Windsor County, the distance from the driver's house to Bellows Falls being 16 miles. This driver receives 3 cents per can of 8½ quarts (or 18¼ pounds) for carting, and this is, of course, paid by the farmer. With a four-horse covered wagon, this collector starts from his home every night in the week at 9 o'clock, going by the most direct road to Rockingham, thence to Bellows Falls. At present this route furnishes 180 cans, which are picked up in different places along the highway to Bartonville. It takes about six hours to make the trip, which could be done in considerably less time but for the work of picking up the cans. The route is not particularly pleasant by night, and especially is this true in stormy weather, yet for the 365 nights in the year this driver faithfully performs his duty, whether in storm or starlight. The trip is not infrequently attended with disagreeable and even dangerous features, as was the case during the floods of 1897, when the highway was washed out in several places, necessitating a roundabout trip of several miles through Saxtons River. But the milk was delivered every morning at the car before the time of leaving Bellows Falls for Boston.

On arriving at the car the milk is weighed by those in charge and the weights credited to the numbers representing the respective dairymen. The milk car starts daily at 5.30 a. m. and reaches Boston about four hours later, and twenty-eight or twenty-nine hours after the morning milking of the day before. Since the establishment of this route, in the year 1890, the business gradually increased until June, 1897, when the shipments amounted to nearly 700 cans a day.

Boston system summed up.—The advantage of this system of handling milk by large wholesalers, combined into an association, is that the business is in the hands of solvent parties, who can be relied upon to pay the farmers promptly the money due them; the business is done in a uniform, methodical way, all producers being treated alike; there is more publicity to the business than there would be if the milk were sold to a great many small, isolated peddlers. The existing Boston system maintains a more steady market than would otherwise be possible, by keeping off from it an undue surplus which would break the

price; consequently this arrangement insures better prices to farmers than they would otherwise get. Another advantage is in the fact that this large combination of wholesalers doing business in a systematic way, with regular chemists, etc., is a powerful factor in elevating the quality of milk on the market and helping to bring it up to a satisfactory standard. With good laws to start with, to which reference will be made further on, and a strong financial interest working to sustain these laws, a great deal is done for the quality of milk.

There are disadvantages connected with the Boston system, some of which have been sufficiently described. Another is that it does not stimulate any advance in quality of milk beyond meeting the standard required by law.

Other milk supply.—It has already been stated that the milk brought into the city by the contractors is about three-quarters of the whole supply. A portion of the other one-fourth comes in by railroad, brought by peddlers who go into the country and buy direct from the farmers. These peddlers usually buy on the basis of the contractors' prices, for these prices set the pace for about all of the milk business, and, to a large extent, govern it. But these peddlers buy only what their ordinary trade will take. If they occasionally need extra milk they can buy it of the contractors. Though these peddlers pay no more than the regular price, the farmer gets the full price for all that he sells, because the peddler whom he supplies never has a surplus for which to pay a lower price. On the other hand, the more of such business there is the more the surplus tends to increase in the hands of the contractors. Their burdensome surplus is a convenience in a pinch to the outside peddler, who competes with them for milk and for customers, but who carries none of the inconvenience of a surplus.

Another portion of the milk of the Greater Boston is produced within its limits. This is not much of a factor in the city proper, but the geographical and business reasons which lead to the grouping of several municipalities as the Greater Boston necessarily include a few places which produce nearly all of their local milk supply. In one or two instances—Milton especially—the place supplies milk to some of its neighbors. Over 7,000 cows are kept in the Greater Boston, located as follows:

Boston	850	Malden	169
Chelsea	87	Medford	282
Revere	168	Melrose	214
Winthrop	83	Newton	1,212
Quincy	656	Somerville	314
Milton	804	Stoneham	311
Winchester	240	Arlington	236
Woburn	362	Belmont	173
Watertown	281	Saugus	544
Waltham	882	Lynn	342

A third source of supply of outside milk is from territory contiguous to the Greater Boston, which can be reached by a drive of 10 to 15

miles. This region is quite thickly settled, and consumes considerable milk, yet it also produces much milk to sell in Boston, which is brought in by wagons. The inspector of the city of Boston reports 5,232 cans sold daily in his jurisdiction, aside from the railroad milk. The milk in other cities and towns of the Greater Boston not brought by rail must be 5,000 cans more. Two of the largest towns for milk shipments by team are Dedham and Bedford, from each of which nearly 1,000 cans are daily hauled.

This nearby milk, although only about one-fourth of the city supply, has shown a tendency to increase of late; its competition with railroad milk was unusually severe during the last few months of 1897. This has been because milk has been maintained at such an even price, because there has been an unusual disparity between the sale-milk value and the butter value of the product, and because prices of other farm products were so depressed that milk was relatively the most profitable farm product, in very many cases.

PROVIDENCE.

Providence, the second in size of the New England cities, has an estimated population of 150,000. The best estimates obtainable place the milk consumption at 75,000 quarts per day. This amounts to 27,375,000 quarts per year. This milk is sold from 407 peddlers' wagons and 900 stores, restaurants, bakeries, etc. Nearly all of the milk is produced within 20 miles of the city. Most of the milk that is brought in wagons comes an average distance of 12 miles, though a little comes 20 miles each day. The balance is carried by railroad. One car brings in 9,500 quarts per day. This car starts from Willimantic, Conn., a distance of 60 miles. About 4,000 quarts per day are carried on the other railroads in express and baggage cars. The milk is shipped, for the most part, in cans similar in general style to the Boston milk can, but containing 9½ and 10½ quarts.

The selling of milk from stores is more prevalent than in many other cities of New England. It is estimated that almost half of the milk consumed in this city is sold from stores instead of being delivered from house to house by peddlers. Most of the railroad milk goes directly to stores.

The price of milk for the last few years has been quite uniform, consumers paying usually a cent less in the summer than in the winter. The retail summer price ranges from 5 to 7 cents and the winter price from 6 to 8 cents. The wholesale price per can in the summer is at the rate of 15 or 16 cents per gallon, and 19 or 20 cents per gallon in the winter. About one-third of the nearby milk is sold by the producers themselves, who drive into the city every morning with their supplies, retailing from house to house. About two-thirds of the nearby milk is sold by peddlers who buy milk from the farmers. Some of them buy from middlemen, who pick up milk from the farmers and haul it to the city. In these cases the peddlers do not see or know the men who

produce the milk for them. These middlemen, however, differ from those in Boston in that they occupy a much less conspicuous place in the business than the Boston contractors and are hardly more than agents and teamsters for the city peddlers.

The producers receive 11 to 12 cents per gallon for milk in the summer, and 15 or 16 cents in the winter.

The population of Providence has increased from 120,000, in 1886, to 150,000 in 1896, or 25 per cent; but the consumption of milk appears to have increased about 122 per cent, only 33,700 quarts per day being reported in 1886. These figures show that there has been greatly increased consumption of milk per capita during the last few years.

Milk is from twelve to forty-eight hours old when it reaches the consumers in Providence.

OTHER CITIES.

The reports from the other New England cities are, for the most part, without novel features. To go into the details about each city would be mere repetition, to a large extent. The milk generally is brought into the city early in the morning by retailers who are, for the most part, producers. In some instances peddlers buy the supplies of farmers and act only as middlemen. In other cases the farmer supplements his own supply by buying from his neighbors. The milk is mostly produced within a dozen or fifteen miles of the city where it is consumed. The night's milk is not over 12 hours old when it reaches the consumers; the morning's milk not over 6. Consequently less pains are taken in cooling and caring for the milk than when it becomes 48 to 72 hours old before reaching the consumer. Six cents per quart is the average price to consumers. In some cities the price drops to 5 cents in the summer, and in a few instances 7 cents is reached in the winter.

The usual method of distributing milk is by pouring from the 8½-quart cans into the individual cans, pitchers, or bowls of customers at their doors, although some peddlers carry individual cans. The use of glass bottles is comparatively rare, though increasing. In many cities the old-fashioned wagons are giving way to vehicles built low-down expressly for the milk business. In many cases farmers who sell milk pay some attention to vegetables and small fruits, which utilizes help, insures an advantageous rotation of tillage, helps out the supply of manure, and assures a retail market for eggs, fruit, or vegetables.

Worcester, Mass., has a population of 110,000 at present, and annually consumes 2,076,000 cans, which is sold from 650 wagons and stores. It is retailed for the most part at 6 cents per quart, summer and winter. In the city and suburbs are a number of superior Jersey and Guernsey herds, for whose milk better prices are obtained. Worcester has a very efficient milk dealers and producers' association, which does much to promote uniformity in price and to keep up the quality. Many of the Worcester milkmen are market gardeners, who combine the two kinds of farming to advantage.

Most of the Lowell, Mass., daily supply of 3,511 cans comes directly from the farmers within a few miles of the city. But a Boston milk train passes through the city, and at times a little railroad milk is left. Milk retails for the most part for 5 cents per quart in the summer and 6 cents in the winter. One hundred and seventy-six milk dealers' licenses are issued in this city. The population is 84,000.

Burlington, Vt., uses about 365,000 gallons annually, which is sold by about 140 peddlers, many of whom are producers. The population in 1890 was 15,000, but it is estimated now at about 20,000. The per capita consumption of milk has increased materially during the past ten years. The trade has nearly doubled, while the increase in population is about one-third. Prices at retail range from 4 to 6 cents in the summer, and from 5 to 7 cents in the winter.

Augusta, Me., with a population of 12,000, uses 1,600 to 2,000 quarts of milk daily, mostly retailed at a uniform price of 6 cents the year around. The farmers who produce the milk for the most part retail it.

Portland, Me., uses the milk of about 4,000 cows, which amounts to about 2,250,000 gallons a year. Some of this milk is sent in by railroad in baggage and express cars. This is retailed by peddlers, who are mostly middlemen. The milkmen supplying the Portland market have an organization.

New Bedford, Mass., has 151 licensed dealers retailing 24,000 or 25,000 quarts per day; the retail prices are mostly 6 and 7 cents. Producers largely retail their own supplies.

Taunton, Mass., has 24 licensed dealers and uses about 12,000 quarts per day. The retail price is 6 cents summer and winter.

Hartford, Conn., licenses 152 regular retail dealers. An average of 26,000 quarts is sold daily. All is produced within 10 miles of the city.

THE CREAM TRADE.

The cream trade has increased rapidly in Boston, Providence, and other cities during the past few years. Formerly there was a small supply and limited demand. The business was not pushed. A person who wanted cream could in most cases be supplied by his milkman, and the large Boston contractors did quite a cream trade. Still, cream was generally looked upon as a special luxury. The increasing use of the separator helped to develop the business, making it more easy than ever before to secure sweet cream of good keeping qualities.

The great increase in the cream business, however, has been due to the systematic business-like push and enterprise of a few Maine creameries. This business began in the latter part of the eighties. The cream is sent in 6-gallon cans, packed in ice, by express on fast trains, reaching Boston about 6 o'clock in the morning. It is there received by agents of the proprietors, put into half pint, pint, and quart glass jars, and delivered at once. It is not only delivered direct to families, but is a common and staple article of merchandise in the grocery stores in

Boston, Providence, and other portions of southeastern New England. Many stores which took experimentally only one or two cans to begin with, found their trade rapidly increased, as the public quickly "caught on" to the possibility of getting cream of reliable quality and good condition for keeping.

This cream is of uniform quality, heavy and rich, being about 45 per cent butter fat, is put up in attractive and convenient form, and keeps well. This has stimulated a growing demand.

Such signs as "Bangor cream," "Hampden cream," "Wallingford cream," are now a frequent and familiar sight in a majority of grocery and provision stores. The cream is retailed in Boston at 60 cents per quart.

One establishment shipping cream from Maine makes the following report of its business for the last three years, showing the increase in the use of cream. The figures are for gallons:

Thick cream, 47 per cent butter fat.

	1894.	1895.	1896.	First six months of 1897.
Boston and vicinity	33,466	40,141	43,542	28,034
Beverly, Lynn, and Salem	8,033	8,811	9,432	4,333
Places outside of Massachusetts	1,531	1,476	1,502	1,564
Total	43,030	50,428	54,476	33,931

Thin cream, 18 per cent butter fat.

	1894.	1895.	1896.	First six months of 1897.
Boston and vicinity	667	6,645	12,618	4,925
Lynn, Salem, and Beverly		702	1,969	914
Total	667	7,347	14,587	5,839

Other Maine creameries are also making large shipments. Faster railroad trains are said to be necessary to still further develop this cream trade. The creameries are mostly proprietary, buying milk of the farmers. As a rule there are no particular feeding materials to which objections are raised to the farmers using, but much pains are taken to impress the great importance of cleanliness in every detail of the business.

SKIM MILK.

The skim milk problem is of considerable importance in the city of Boston. As we have shown above, a great deal of the surplus milk is made into butter after it reaches the city. Consequently, there is a supply of skim milk more than usual in such a center. A great deal of this is allowed to run into the sewers, as there is no market for it; some is sold, and some is returned to the farmers, but the greater part is

thrown away. This is a great loss of food material, and if the people of the city could realize the food value of skim milk, and could buy it at a reasonable price, much good would result. But as ordinarily sold, a quart of skim milk too often replaces a quart of whole milk, and thus to that extent injures the sale of whole milk. Further than that, skim milk is to quite an extent used to adulterate whole milk; just how much no one can say. When milk is adulterated with water, the amount of solids not fat is reduced in the same proportion as the fat, and the abnormally low amount of solids not fat is evidence of the work of adulteration. But when the adulterant used is skim milk, the solids not fat remain the normal amount; consequently, the adulteration is more difficult to detect; hence, more dangerous.

In the other cities there is something of a sale of skim milk, but it is much less, that in Lowell, for instance, amounting to 2,227 quarts per day. The most of this skim milk sold out of Boston is sold honestly as a valuable food product.

The use of buttermilk is not so extensive as it ought to be, and yet in some cities considerable goes into consumption. In Lowell something like 850 quarts per day are sold. In Worcester the product of one or two creameries is retailed each day. But speaking in a general way, the sale of buttermilk is quite small.

CONDENSED MILK.

The use of condensed milk is increasing, especially in Boston. A large city collects many people who are compelled to keep house in restricted quarters; in not a few instances shop and office girls practice light housekeeping in a single room. In these and other cases the can of condensed milk is a convenient article. New England has six condensed-milk factories, and the product from the West and even from abroad is also sold in the grocery and provision stores.

MILK CONSUMPTION PER CAPITA.

The consumption of milk per capita is a very difficult thing to get at, and statistics on this point must necessarily be more or less faulty. An effort has been made to gain information on this subject and a careful investigation of the quantity of milk sold in a number of cities has been made, and the amount ascertained has been divided by the population. The result is remarkably uniform, as follows (the figures indicate hundredths of a quart used daily per capita of population):

Boston ..... .48	Haverhill ..... .45	Nashua ..... .41
Lowell ..... .33	Burlington ..... .50	Lawrence ..... .40
Hartford ..... .47	Worcester ..... .44	Pittsfield ..... .30
Nashua ..... .42		

In all of these cases it must be remembered that an element of uncertainty exists in the degree of accuracy in the reports of the amount of milk sold with which we have been furnished, but the results are so

uniform that it is hardly fair to suppose that an equal error could have been made in every case. Therefore it seems reasonable to assume, in a general way, that the consumption of milk in Massachusetts cities is a little less than a pint per person per day—a little over four-tenths of a quart. In no case does this include the sales of skim milk, condensed milk, or cream.

MILK LAWS AND INSPECTION.

LEGAL STANDARD AND ADULTERATION.

All of the New England States have laws prohibiting the sale of adulterated or watered milk, or milk from which a portion of the cream has been removed. All of the States except Connecticut have a statute standard for milk.

Massachusetts prohibits the sale of milk "not of standard quality," as well as of adulterated milk, and the following statute defines standard milk:

> If the milk is shown upon analysis to contain less than thirteen per cent of milk solids, or to contain less than nine and three-tenths per cent of milk solids exclusive of fat, it shall be deemed for the purposes of this act to be not of good standard quality, except during the months of April, May, June, July, and August, when milk containing less than twelve per cent of milk solids, or less than nine per cent of milk solids exclusive of fat, or less than three per cent of fat, shall be deemed to be not of good standard quality.

Nearly all of the cases entered in court for the violation of these milk laws complain of the offender for selling, or having in his possession or custody with intent to sell, "milk not of standard quality," instead of "adulterated or watered milk."

The Rhode Island law provides that—

> If the milk shall be shown upon analysis to contain more than eighty-eight per centum of watery fluids, or to contain less than twelve per centum of milk solids, or less than two and one-half per centum of milk fats, it shall be deemed for the purpose of said sections to be adulterated.

The New Hampshire law says that if milk has less that 13 per cent of milk solids said fact "shall be prima facie evidence" that the milk is adulterated. But evidence that milk has less than 13 per cent solids is frequently rebutted by producing or offering to produce some cow which gives milk of less than 13 per cent solids, and therefore the whole law is nullified.

In Maine, "when milk shall be found to contain over 88 per cent of water it shall be deemed prima facie evidence that said milk has been watered, and when milk by the analysis aforesaid shall be found to contain less than 12 per cent of solids and less than 3 per cent of fat it shall be deemed, prima facie, milk from which cream has been taken." This is similar to the New Hampshire law, but we have heard no complaints from Maine over the words "prima facie."

Vermont, like Massachusetts, prohibits the sale of milk "not of good standard quality," as well as adulterated milk, milk from which a por-

tion of the cream has been removed, etc. The Vermont statute defines standard milk as follows:

> Standard milk shall contain not less than twelve and one-half per cent of solids, or not less than nine and one-fourth of total solids exclusive of fat, except in the months of May and June, when it shall contain not less than twelve per cent of total solids.

The laws of the several States also have regulations for promoting honesty in sales of skim milk, such as labeling cans, etc.

Wine measure is by law the standard measure.

OFFICIAL INSPECTION.

All of the States except Vermont and Connecticut have special laws providing for the enforcement of these milk regulations.

In Massachusetts, cities are required and towns are allowed to appoint milk inspectors. In Boston the present milk inspector is a man of ability and energy. He has a respectable salary and sufficient appropriation for collectors of samples, laboratory, etc. Hence the work of milk inspection in that city is very efficiently performed. The following statistics of his work show how thorough it is, and also, inferentially, something of the quality of the Boston supply, the ratio of samples taken to court cases being very small.

Year.	Samples taken.	Cases in court.	Year.	Samples taken.	Cases in court.
1886	8,701	88	1893	13,623	293
1888	9,484	67	1895	12,587	316
1890	13,853	220	1897	12,295	129

In a number of other Massachusetts cities—Lowell, for instance—good work is also done; but in most cases the salary is nominal and the work corresponds, though most of the inspectors earn more than they get. Very few of the towns avail themselves of the permission to appoint inspectors. To cover the field where local inspection is weak, the State board of health and the State dairy bureau are also given authority to enforce the dairy laws. The following statistics show the work of the board of health, scattered over the State:

Year.	Samples taken.	Court cases.	Year.	Samples taken.	Court cases.
1890	3,236	24	1893	3,073	67
1891	2,726	49	1894	3,551	76
1892	3,271	72	1897	6,104	48

Convictions followed in about 90 per cent of the cases.

Rhode Island has a law similar to Massachusetts as regards local milk inspectors. New Hampshire law permits the appointment of such officers. In Maine, cities and towns of not less than 3,000 inhabitants must appoint milk inspectors. In most cases, however, in all of these

States there is little inspection and in many cases no inspector. Particular mention should be made of the good work in Providence, R. I., Nashua, N. H., and Hartford, Conn. The inspector of the latter city is appointed under the provisions of a city ordinance.

The regulations in the different States as to the duties and authorities of milk inspectors are similar. The inspectors and collectors of samples employed by them are authorized to enter all places where milk is stored or kept for sale and all carriages used for the conveyance of milk and take samples for analysis from all such places or carriages.

The laws of the different States where there are milk inspectors provide for registering and licensing milk dealers for a nominal fee. This is done for the purpose of securing proper identification of the dealer.

The legal supervision hitherto noticed has related almost entirely to the commercial fraud of selling less food than the purchaser supposes he is receiving for his money—*i. e.*, milk watered, skimmed, or naturally of less than average quality.

SANITARY LAWS AND INSPECTION.

All of the States have laws relative to the healthfulness of the milk supply. Massachusetts, Maine, Rhode Island, and New Hampshire prohibit the sale of milk from sick or diseased cows or cows fed upon the refuse of breweries or distilleries or upon any substance deleterious to its quality. Connecticut prohibits the sale of "impure milk" and milk from cows which shall have been adjudged by the commission upon diseases of domestic animals to be affected with tuberculosis or other blood disease. A Massachusetts law imposes a fine upon "whoever knowingly feeds or has in his possession with intent to feed to any milch cow any garbage, refuse, or offal collected by any city or town."

There is, however, no especial sanitary inspection of milk and its sources in any New England town or city, and cases are rarely brought in court for violation of any of the above sanitary laws. The milk inspection now in vogue relates almost exclusively to commercial frauds rather than to health matters. The Massachusetts state board of health has done some good work in investigating several typhoid-fever epidemics, which in a number of cases have been traced to the milk supply. Local boards of health, however, have considerable authority, and in several cases they have issued orders or made regulations in advance of the average practice of the State. Hartford, Conn., Portland, Me., and Lynn, Mass., are instances. The contagious-cattle-disease law of Massachusetts provides for a cattle inspector in each town, who makes a semiannual inspection of neat stock, quarantining suspected animals, which are subsequently tuberculin-tested, and if found to be diseased are destroyed. In a few instances—Pittsfield, for example—the milk inspector and cattle inspector are one and the same person, which is a decided advantage.

The milk inspector of Nashua, N. H., has a unique and commendable system of sanitary inspection of the milk supply of that city, which is said to work well. Although his official powers are confined to the city limits and to the commercial fraud of selling adulterated or low-grade milk, all peddlers—mostly producers—are required to answer the following questions when they register:

1. Name of owner? 2. Number of cows? 3. Number of each breed? 4. Food of cows? 5. How is manure stored? 6. Quantity of milk produced per day? 7. Where is milk stored? 8. How is milk cooled? 9. Temperature of milk when sold? 10. Source of water supply for stock and for washing cans? 11. Distance of water supply from barnyard; from privy vault; from cesspool? 12. Are any cows sick upon your premises; if so, how many, and with what disease? 13. Are any persons engaged in handling milk sick?

The inspector also calls from time to time on the farmers who produce milk for the city, even when they reside out of his official jurisdiction. He makes such investigation of the premises as he is permitted, and reports to the board of aldermen the condition of affairs. The board then orders the report published in the local papers. To most milk producers the publicity of an unfavorable milk report is more of a punishment than a court fine, while a favorable report is a valuable advertisement. Hence, as much is accomplished as if there were more stringent laws, and there is none of the friction that might arise from over-officiousness or unpopular official prying. He also issues the following:

[Circular.]

CITY OF NASHUA, N. H.,
DEPARTMENT OF MILK INSPECTION.

The importance of education in the better care of milk is so great that I feel it a duty to call attention to certain precautions necessary to a good product. The average farmer has so many cares that he sometimes fails to give this important subject proper attention.

Milk in the udder of the healthy cow contains none of the microorganisms of fermentation or decay, and could it be drawn thence into an hermetically sealed receptacle, without coming in contact with the air, it would keep without change for an indefinite time. Of course this is not practicable in an ordinary dairy, but care can certainly be exercised that the surrounding atmosphere with which it does come in contact is as free as possible from germs, odors, or taints, for these the milk absorbs with great rapidity.

Milk which has stood for ten minutes in an open vessel in a tainted atmosphere will be found to contain from 10,000 to 100,000 germs per cubic centimeter (a cubic centimeter represents about one-third of a cubic inch), while in two hours from 2,000,000 to 5,000,000 germs will be found per cubic centimeter. This prodigious increase can be stopped by removing the milk to a proper cooler. I have explained the necessity of pure water and wholesome food for cows so often before that I will not repeat it. But I wish to call attention to the following precautions in the handling of milk:

All stables should be ventilated.
They should be as clean as possible.
Cows should be carefully groomed.
The milk should be drawn from the cow as rapidly as possible.
The milk should not be left standing in the stable a moment longer than necessary.

The cooler should be so remote from the stable that no odors can reach it.
Its temperature should be at from 45° to 50° F., and
The milk should be aerated to remove animal odors.

Under these improved conditions cows not only yield better milk but more of it, and amply repay the labor and trouble expended upon them.

There are in this vicinity dairies infamous alike in their cruelty to animals, in their brutalizing influence upon men, and in their disease-spreading effects upon infants and the general community; but I believe that a vast majority of our farmers desire to do right if but the means and knowledge were presented to them.

I. F. GRAVES, *Inspector of Milk.*

Health orders.—The board of health of the city of Boston has the following regulation:

Whereas cows' milk is one of the most common and necessary articles of food, and is oftentimes seriously impaired in usefulness and rendered dangerous to health by the want of proper care in its production or subsequent treatment and handling; it is, therefore, ordered that the following regulation be and is hereby adopted:

SECTION 1. No person shall use any building as a stable for cows unless it contains at least 1,000 cubic feet of space for each animal, is well lighted and ventilated, has tight roof and floors, good drainage, a supply of pure water, and all other necessary means for maintaining the health and good condition of the cows, and has been approved by the board of health.

SEC. 2. Every person using any such building shall keep the same and the premises connected therewith, and all land used for pasturage of the cows, clean and free from filth.

SEC. 3. Every person keeping a milch cow shall permit it to be examined from time to time, as to its freedom from disease, by a veterinarian designated by the board of health.

SEC. 4. No person having an infectious disease, or having recently been in contact with any such person, shall milk cows or handle cans, measures, or other vessels used for milk intended for sale, or in any way take part or assist in handling milk intended for sale, until all danger of communicating such disease to other persons shall have passed.

SEC. 5. No person shall sell or use for human food the milk of a diseased cow, or permit such milk to be mixed with other milk, nor until it has been boiled shall use such milk, or any mixture of such milk, for food of swine or other animals.

QUALITY OF MILK SOLD.

The word quality when applied to milk may mean the amount of milk solids (which is the best acceptation) or it may have reference to flavor, disease germs, bacteria of decay, etc. From what has been said above it will be seen that in whatever sense we use the word the quality of milk receives considerable attention, especially as to its composition.

In Massachusetts the law creating a legal standard of 12 and 13 per cent is well enforced, and milk in the market usually averages even above the standard. All of the large Boston wholesalers employ chemists, who devote all of their time to testing the supplies which they receive. If the milk of any dairy is below the statute standard, warning is sent to the producer, and if the warning does not result in an improved quality of milk the supply from that dairy is dropped. In some instances where there is unmistakable evidence of watering the

case is turned over to State officials for prosecution. This unofficial inspection weeds out a lot of milk that might be below the standard before it is put on the market, and insures to peddlers the purchase of milk that will not get them into trouble.

In Providence a lower standard exists than in Massachusetts, which causes the milk inspector some trouble. Most natural milk has over 12 per cent of solids. A small amount of water can be added to 13 or 14 per cent milk without changing the proportion of fat and solids not fat sufficiently to warrant a verdict against the adulterator. Most judges will convict only when the milk is below the statute standard, and do not feel convinced of the guilt of the defendant on the simple assertion of a chemist that the relation of fat and solids not fat is such as to create a certainty that the milk is adulterated.

In the smaller cities and towns statistics from samples of milk taken by various officials show, usually, a higher quality than samples from milk sold in Boston or Providence, although the milk in those places is up to the statutory standard, for the closer the contact between the producer and consumer the better the quality of the milk. The occasional meeting of producer and consumer, face to face, has a tonic and stimulating effect on the former, which tends to keep up the quality of the milk supply. One of the disadvantages of shipping milk by railroad is that the producer never sees the consumer, oftentimes not even the peddler, and has no interest in his supply further than to avoid a word of warning from the contractor's chemist.

Milk substantially above the statutory standard is more frequently found among farmers retailing their own milk supply direct to consumers than elsewhere.

The following is the result of analyses of milk taken from milkmen by officers of the Massachusetts Dairy Bureau in the regular discharge of their routine duties, and throws an accurate sidelight on the per cent of solids sold. These samples were taken in May and June, when the legal standard is 12 per cent.

Worcester: Samples from 28 milkmen ranged from 12 to 14.34 per cent total solids and averaged 13.06 per cent.

Taunton: Five samples ranged from 12.54 to 14.28 and averaged 13.50 per cent.

New Bedford: Thirty samples ranged from 11.84 to 15.02 and averaged 13.30 per cent; 14 of them were above this average.

The following are the figures of four days' routine work of the Boston milk inspector. The standard for July is 12 per cent.

Inspections for four days in July.

	26th.	27th.	28th.	29th.
Samples from shops ..... Number..	20	9	19	0
Samples from wagons ..... do...	30	21	31	30
	50	30	50	30
Above the standard:				
From shops ..... do...	19	9	18	0
From wagons ..... do...	30	20	31	27
	49	29	49	27
Below the standard:				
From shops ..... do...	1	0	1	0
From wagons ..... do...	0	1	0	3
	1	1	1	3
Poorest sample above standard ..... Per cent..	12.12	12.06	12.06	12.25
Poorest sample found ..... do...	11.92	11.96	11.20	11.40

The Providence milk inspector reported that he examined 24 samples of milk on the 24th of July and 47 samples on the 26th, and found the results as follows:

Number of samples.	Total solids (per cent).			Fat (per cent).			Solids not fat (per cent).		
	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.
24	13.75	11.10	12.60	5.00	3.00	3.81	9.40	7.50	8.80
47	*14.35	†9.65	12.21	*6.00	2.20	3.59	9.39	†7.25	8.63

* Same sample. † Same sample.

This inspector remarks: "This does not represent the average quality of the milk sold in Providence, neither would the figures obtainable for any other two days, unless by chance."

The following figures are from the inspector of milk at Lowell:

	Per cent.	Number of samples.
Average solids for February, 1897	13.42	197
Average solids for June 5, 1897	12.96	237
Average solids for June 21, 1897	13.06	23
Average solids for July 19, 1897	12.82	24

The above figures will give some idea of the amount of solid matter in milk as sold in New England cities.

Regarding milk in the second sense of the word "quality," we are confronted by two positive opinions, and those apparently very contradictory. In spite of the healthfulness of the Boston milk supply, Professor Sedgwick, of the Institute of Technology, a bacteriologist of note, embraces every opportunity to criticise Boston milk.

On the other hand, Dr. Conn, of Wesleyan University, a well-known bacteriologist who has made dairy products a special study, says what might be construed as a flat contradiction—that Boston has probably a better milk supply than any other city in the world. There is doubtless truth in both statements, their seeming inconsistency being explained by the different standpoint of the two students. One speaks from the

standpoint of the idealist, and finds much that needs condemnation; the other speaks of things comparatively, as he finds them in many places.

Much of the milk supply of Boston comes from such distances that the selfish interests of the producers compel precautions that otherwise would be unnecessary. Filthy milk, drawn under indifferent conditions, will not be sweet and wholesome when from 40 to 70 hours old. Consequently, the railroad milk must be, even without legal requirement, more or less carefully attended to. Many of the farmers who ship milk to Boston have ice or running spring water for the quick and immediate cooling of milk, and if their methods get too slovenly the fact is recorded in the poorer keeping qualities of the milk, and sometimes in its return as sour. It is often the fact that the precautions necessary to care for this milk shipped from a distance are such that after arriving in the city it will keep longer than milk from nearby, the producer of the latter not taking so much pains because the milk was to be delivered at once.

The general dissemination of information as to the bacteriological cause of milk's souring—the work of colleges, experiment stations, and newspapers—is leading farmers to become more and more particular in regard to cooling it as soon as possible after milking, and taking the other necessary precautions for the purpose of insuring its keeping. Another influence, however, is pulling the other way. Quite a change in the nationality of the farmers is going on. Farms are passing from the native New England stock into the hands of those more recently descended from other countries, thrifty, industrious people, and good citizens, but for the time being in some instances they are not as well informed in the latest and best agricultural methods. They are not book farmers, and frequently a change of farm owners means a temporary deterioration in the milk supply from that farm.

The methods of some city peddlers are open to criticism; their milk headquarters and their stables are often one and the same building, and sometimes the mixing and canning is not done under perfectly clean conditions.

Outside of Boston the milk supply is reasonably good, as the times go. A general improvement in the supply of the different cities is reported by correspondents. They say that the farmers producing milk are generally reliable and honest; that it is for the most part cooled in running water or ice tanks, and that great improvement has been made during the last few years. Nearly all, however, urge further advances along this line; and while most of the correspondents not only note improvement but claim that their town or city compares well with others, they recognize room for further improvement, and call especial attention to the need of more cleanliness in every department—in vehicles, cans, and the milkmen themselves. Some emphasize the importance of more care in cooling and aeration.

The general attention which has been given to tuberculosis during the past few years has resulted in the destruction of many tuberculous herds, and this has doubtless had a beneficial effect on the milk supply. All of the New England States, except possibly Rhode Island, have had popular agitations of this subject, and sharp dissension has arisen. The point in dispute has been whether the degree of danger from tuberculous milk was sufficient to warrant the public expense and losses to cow owners incident to radical measures in combating the disease. Whatever may be the views of different persons on this subject, all must admit that many tuberculous herds have been exterminated, and that this, at least, can not have injured the milk supply. As a result of this agitation, every town in Massachusetts has a cattle inspector, who makes a semiannual examination of the cows in his town. His official authority is confined to quarantining suspected animals, but the system has done much good in a suggestive way, in improving ventilation, increasing the amount of light, and reducing the uncleanliness of stables.

On the whole, the milk supply of New England cities seems reasonably up to the best average practice of the present times.

NEED OF ADVANCED PRACTICES.

As to more advanced practices, however, it seems that very little is being done. The ideal way of selling milk is not on a dead level at one price, but on its merits and at a price proportionate to quality. A little is already being done in this direction, and a number of dairymen with Jersey or Guernsey herds sell milk above the going price. But we know of no milk sold on a guarantee of its content of solids. It commands an extra price because people know that the milk of such cows is richer than the milk of other cows, and also because it has an improved quality in other directions.

A large dairy farm in Worcester County has for years run to Boston a car of milk from superior Jersey herds, which has been sold above the current price for milk, for the most part at 10 cents per quart. No specific amount of total solids has been guaranteed, but the milk has been better than 13 per cent—nearer 15. When individual glass bottles first came in vogue this company was a pioneer in their use, and later when tuberculin was discovered it was the first to advertise milk from tuberculin-tested cows. Indeed, it still produces the only milk so advertised and sold in Boston. Great pains is taken with the milk on the farm and it is always in good condition.

A resident of the city of Newton, a residential suburb of Boston, has developed a milk business calling for the product of about 150 cows. The milk is sold within a narrow radius to people who might be called his neighbors, who have seen or heard of his methods, and who desire the milk. His cows are Jerseys, tuberculin-tested, kept in one-story barns, with no manure cellar underneath and no hay lofts

overhead. Light and ventilation are ample. Scrupulous cleanliness prevails. Great pains is taken to promote the comfort of the animals. The newest barn has no stanchions, but provides a box stall 7 by 9 feet for each cow. The milk is run through a cooler as soon as drawn, and kept cool by artificial refrigeration—ammonia process. It is then bottled in glass jars, being at a temperature of 38 to 40 degrees, and delivered at once to customers. There are two deliveries a day, and the milk is not over two hours old when in the hands of consumers.

The use of glass jars for the delivery of milk is growing and is somewhat common, though used as yet by a small minority of milkmen. Pasteurizing milk is done only to a limited extent. Here and there some pioneer has entered into this field. The Massachusetts Agricultural College and one or two enterprising dairy farmers within reach of Boston have recently added pasteurizing apparatus to their dairy equipment, and are selling sterilized milk and cream. The number who sell pasteurized milk, in proportion to the whole, is extremely small; still there has been a satisfactory beginning, and frequently additions are made to the number of those who are advancing in this direction.

The pasteurizing of cream is more common. Some of the concerns who supply cream in a wholesale way pasteurize all of their output to enhance its keeping qualities.

A company started in Boston several years ago the sale of "modified" milk. By patent processes this "laboratory" prepares from cream, skim milk, and sugar of milk a compounded milk of any desired composition, for infants and invalids. The company has its own herd of cows, well cared for, to supply the milk.

Some of the large milk dealers of the city are experimenting with filtered milk, and introducing it on a limited scale. The process enhances its keeping qualities, and the milk so treated has been shown by microscopical examination to be almost as free from bacteria as pasteurized milk.

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